



Armed Forces College of Medicine AFCM



Hypothalamus and posterior pituitary

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INTENDED LEARNING OBJECTIVES (ILOs)



By the end of this lecture the student will be able to:

- ✓ Describe functional relationships between the hypothalamus and the pituitary gland
- ✓ List the hormones that are released from the posterior pituitary gland.
- ✓ Summarize the function and regulation of vasopressin hormone.
- ✓ Summarize the functions and regulation of oxytocin hormone.

Lecture Plan



Part 1: Introduction hypothalamus and pituitary gland

Part 2: Main Lecture topics

- o Antidiuretic hormone
- o Oxytocin

Part 3: Summery

Lecture Quiz

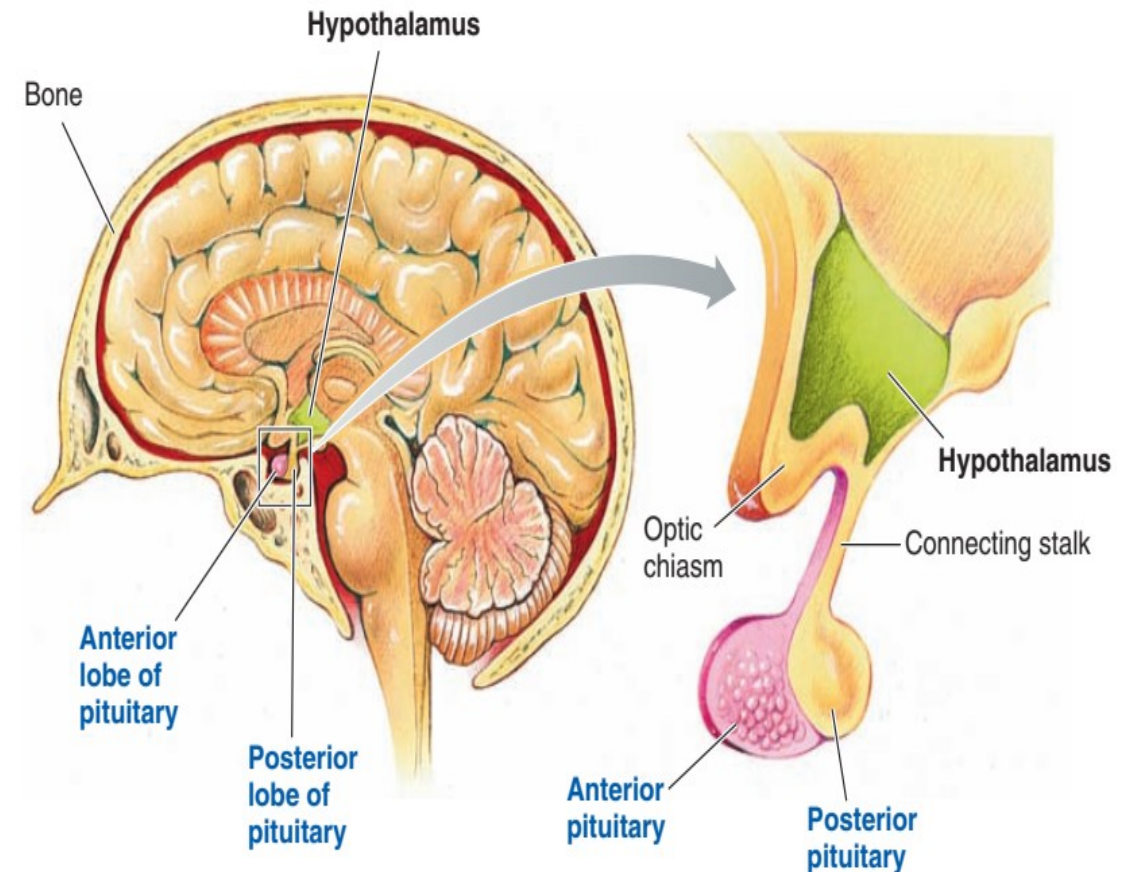


Hypothalamus and pituitary gland



Hypothalamus: This is the main interface between the nervous system and the endocrine system

Connected to the pituitary gland by pituitary stalk



Lauralee Sherwood, Human Physiology, From Cells to Systems, 2016

Hypothalamus and pituitary gland

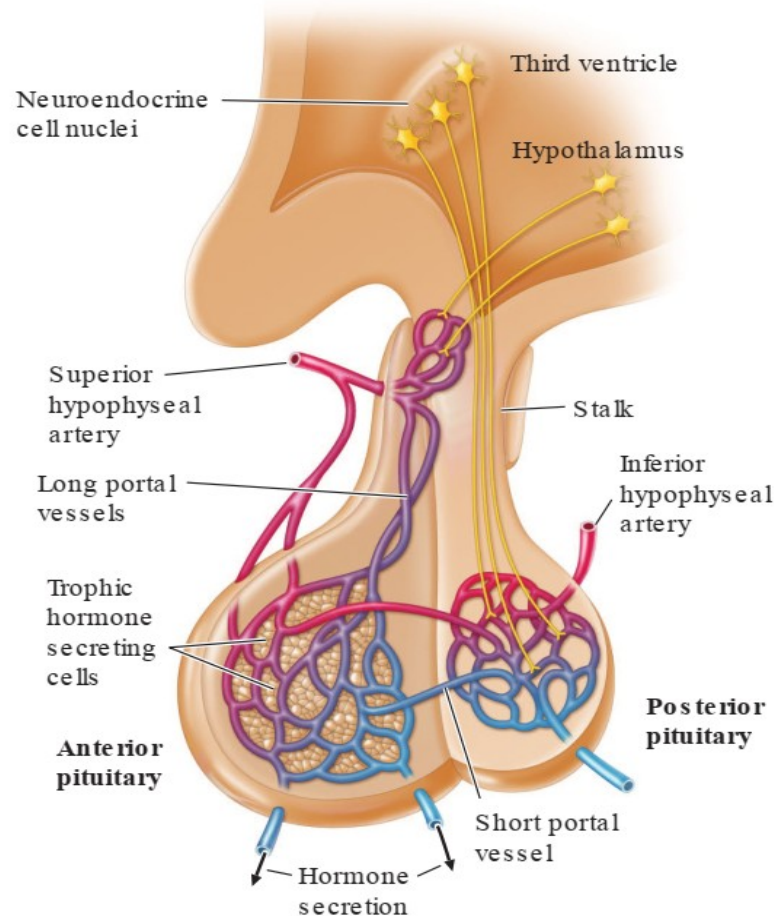


Anterior lobe (adenohypophysis):

It consists of glandular epithelial tissue

Connected to the hypothalamus by vascular connection (Hypothalamic-hypophyseal portal circulation)

Synthesize hormones



HARRISON'S ENDOCRINOLOGY, 4th Edition, 2017

Endocrine & Genitourinary Module

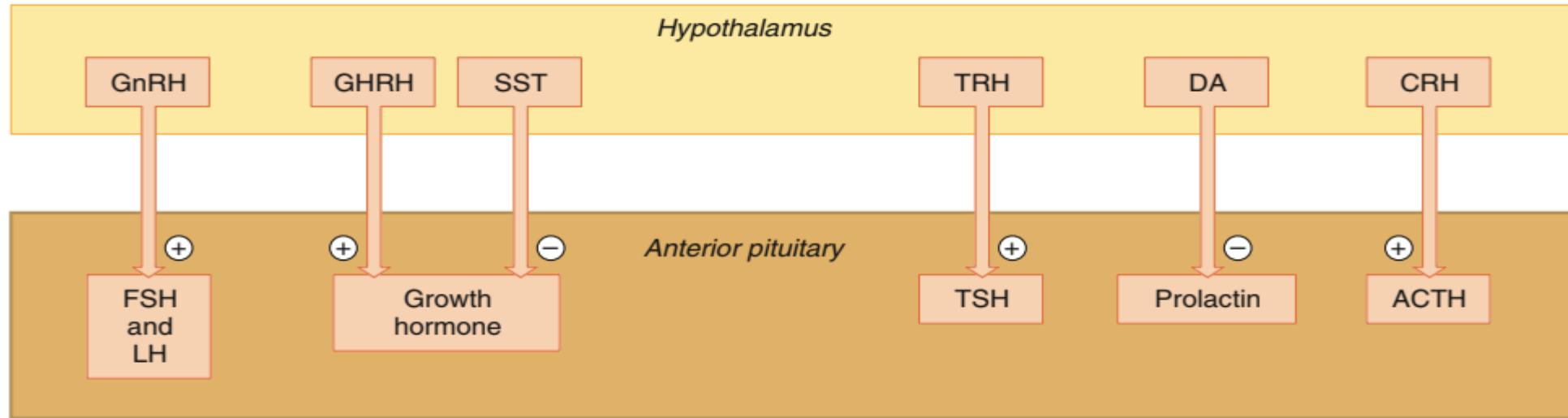
Posterior lobe (neurohypophysis):

composed of nervous tissue

Connected to the hypothalamus by nervous connection (Hypothalamic-hypophyseal tract)

Release the stored hormones synthesized by hypothalamus

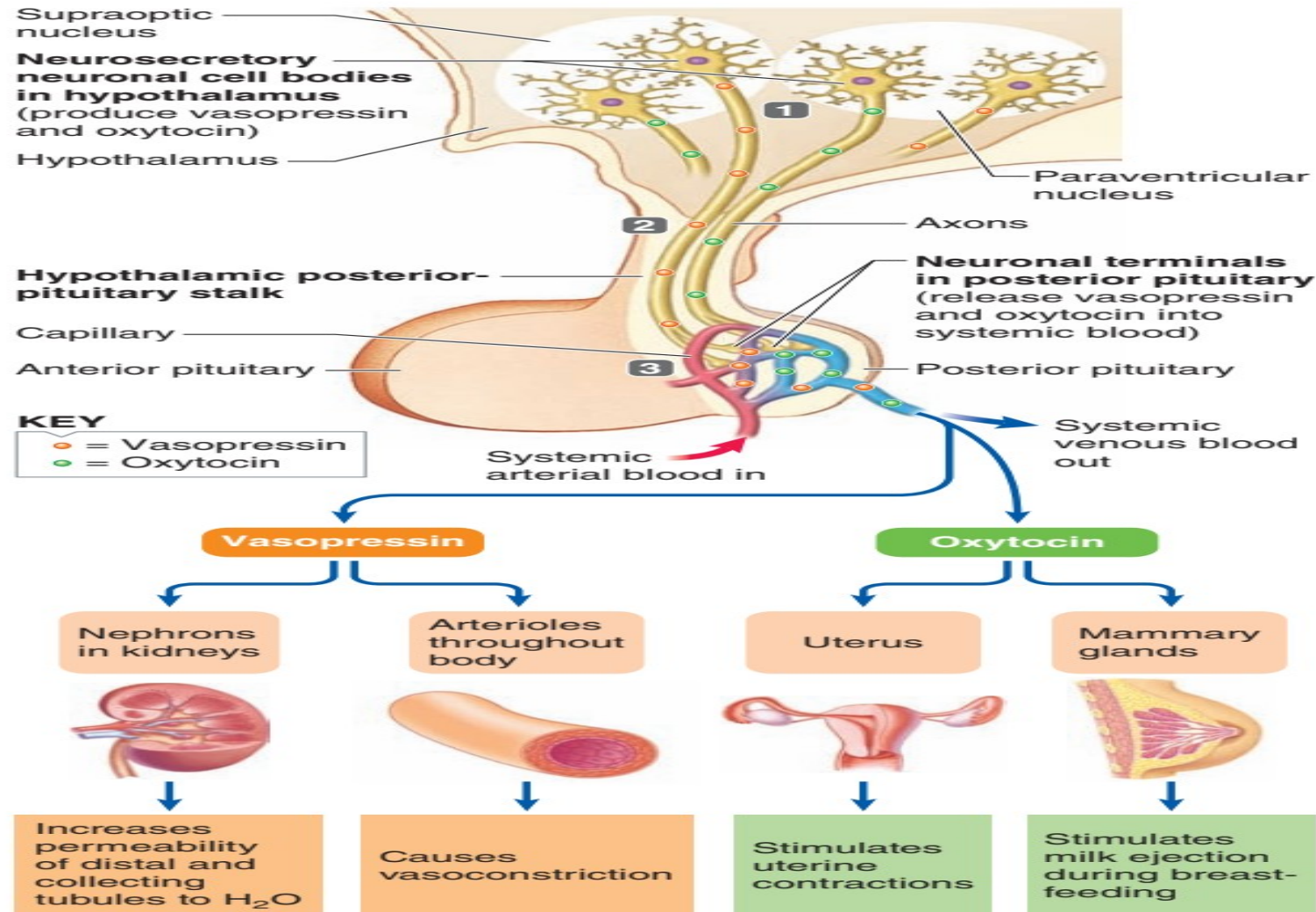
Hypothalamus and pituitary gland



Major known hypophysiotropic hormones	Major effect on anterior pituitary
Corticotropin-releasing hormone (CRH)	Stimulates secretion of ACTH
Thyrotropin-releasing hormone (TRH)	Stimulates secretion of TSH
Growth hormone-releasing hormone (GHRH)	Stimulates secretion of GH
Somatostatin (SST)	Inhibits secretion of GH
Gonadotropin-releasing hormone (GnRH)	Stimulates secretion of LH and FSH
Dopamine (DA)*	Inhibits secretion of prolactin

VANDER'S HUMAN PHYSIOLOGY: THE
MECHANISMS OF BODY FUNCTION,
FOURTEENTH EDITION , 2016

Posterior pituitary gland



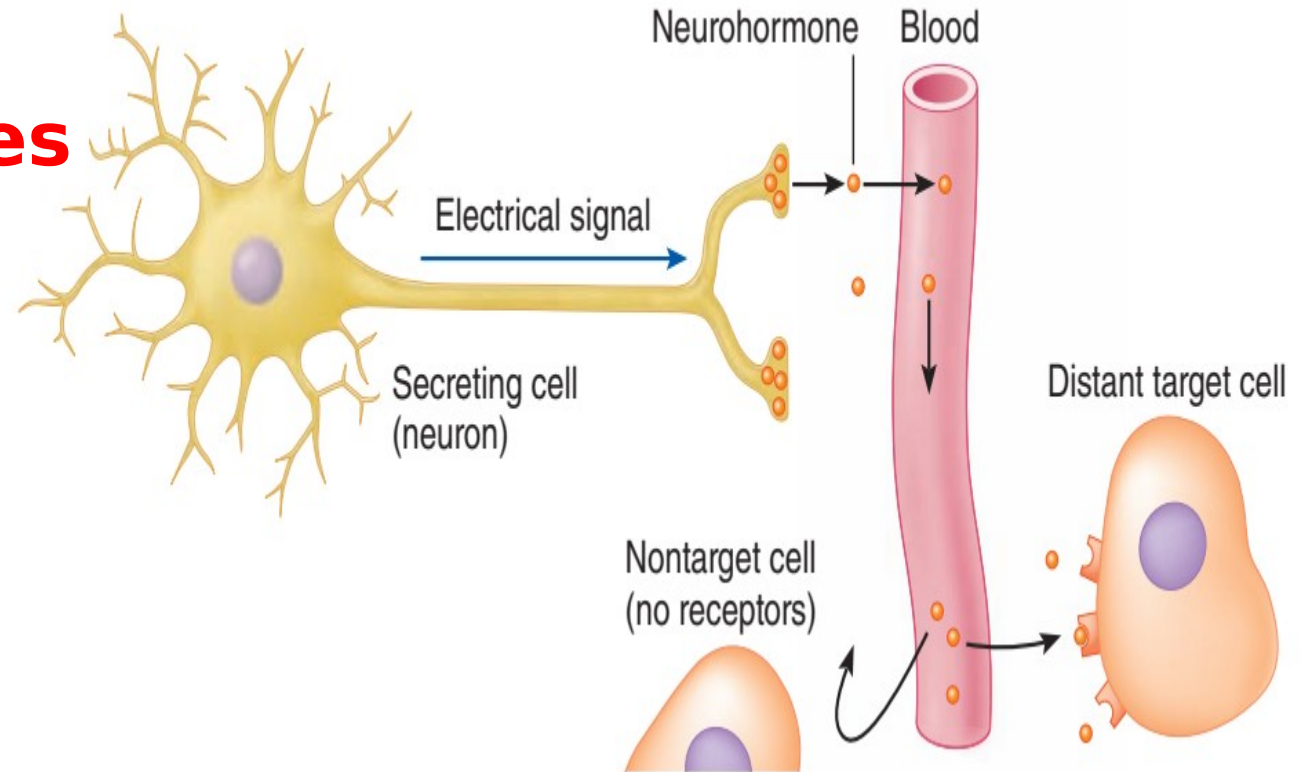
Lauralee Sherwood, Human Physiology, From Cells to Systems, 2016

Posterior pituitary gland hormones



Oxytocin and vasopressin are typical neural hormones

What is the meaning of neural hormones?



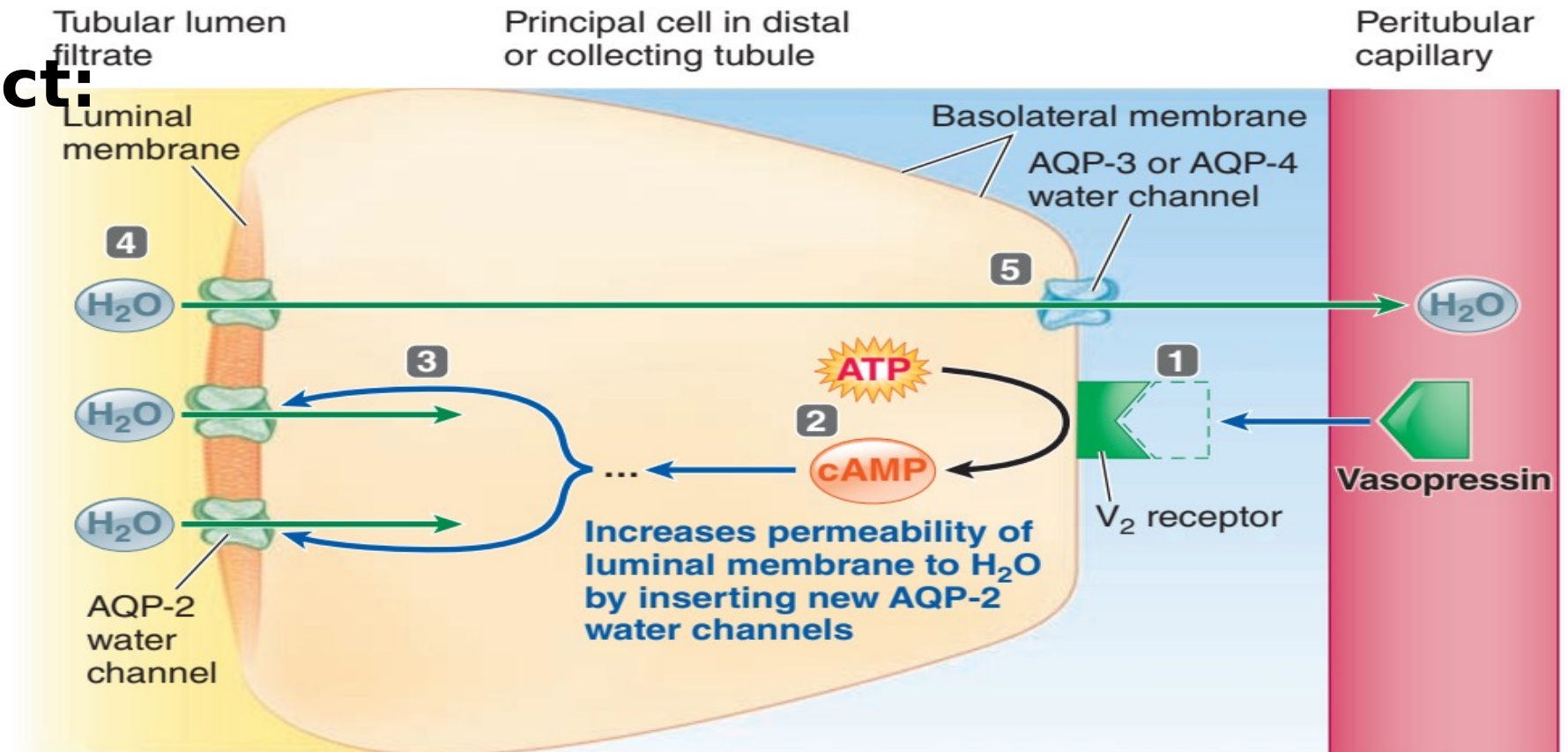
Lauralee Sherwood, Human Physiology, From Cells to Systems, 2016

Antidiuretic hormone (Vasopressin)



Action:

1- Renal effect:



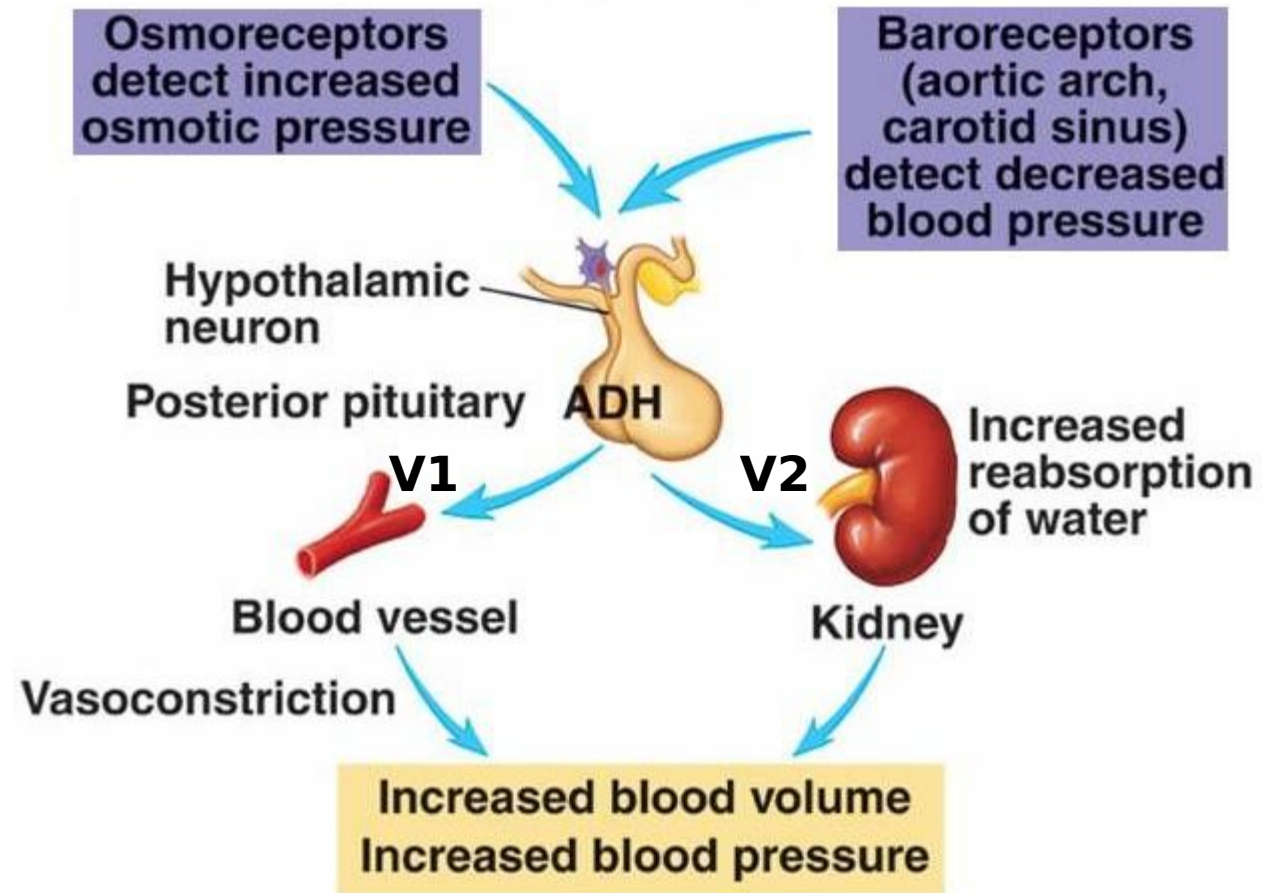
Lauralee Sherwood, Human Physiology, From Cells to Systems, 2016

Antidiuretic hormone (Vasopressin)



Action:

**2- Contraction of
vascular smooth
muscle:**

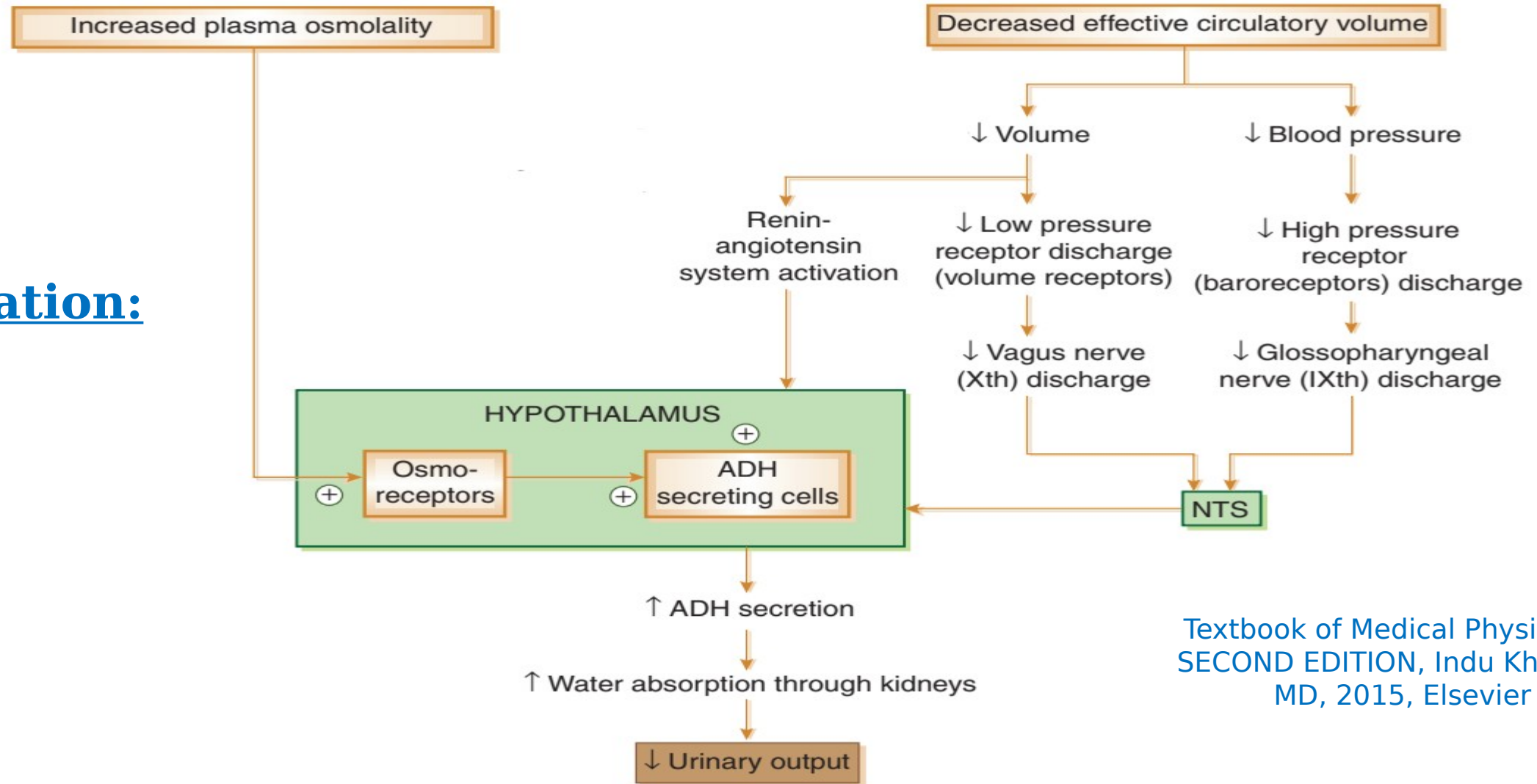


Lauralee Sherwood, Human Physiology, From Cells to Systems, 2016

Antidiuretic hormone (Vasopressin)



Regulation:



Textbook of Medical Physiology,
SECOND EDITION, Indu Khurana,
MD, 2015, Elsevier

Antidiuretic hormone (Vasopressin)



Regulation:

- Pain, nausea, hypoglycemia, and various drugs (e.g., nicotine, opiates, antineoplastic agents) all stimulate the secretion of ADH
- Ethanol, α -adrenergic agonists, and ANP (Atrial natriuretic peptide) inhibit secretion of ADH

Complete:

Vasopressin act through V1 receptor to produce vasoconstriction while it binds to V2 receptor to increase water permeability from distal tubules and collecting ducts



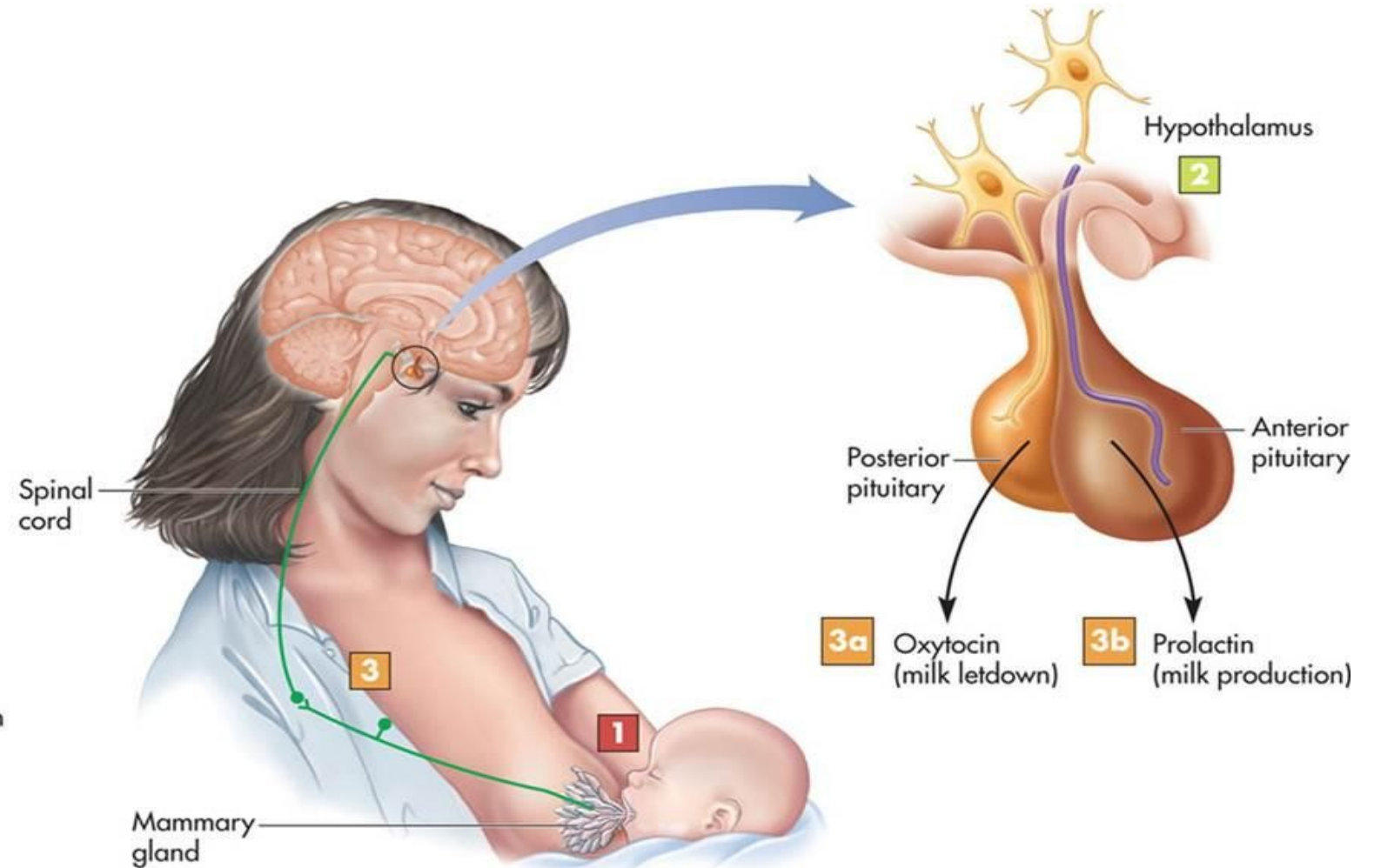
Oxytocin



Action:

1- Milk ejection:

- 1** Suckling stimulates nerves in the nipple and areola that travel to the hypothalamus.
- 2** In response, the hypothalamus stimulates the posterior pituitary to release oxytocin and the anterior pituitary to release prolactin.
- 3** Oxytocin stimulates lobules in the breast to let down (release) milk from storage. Prolactin stimulates additional milk production.



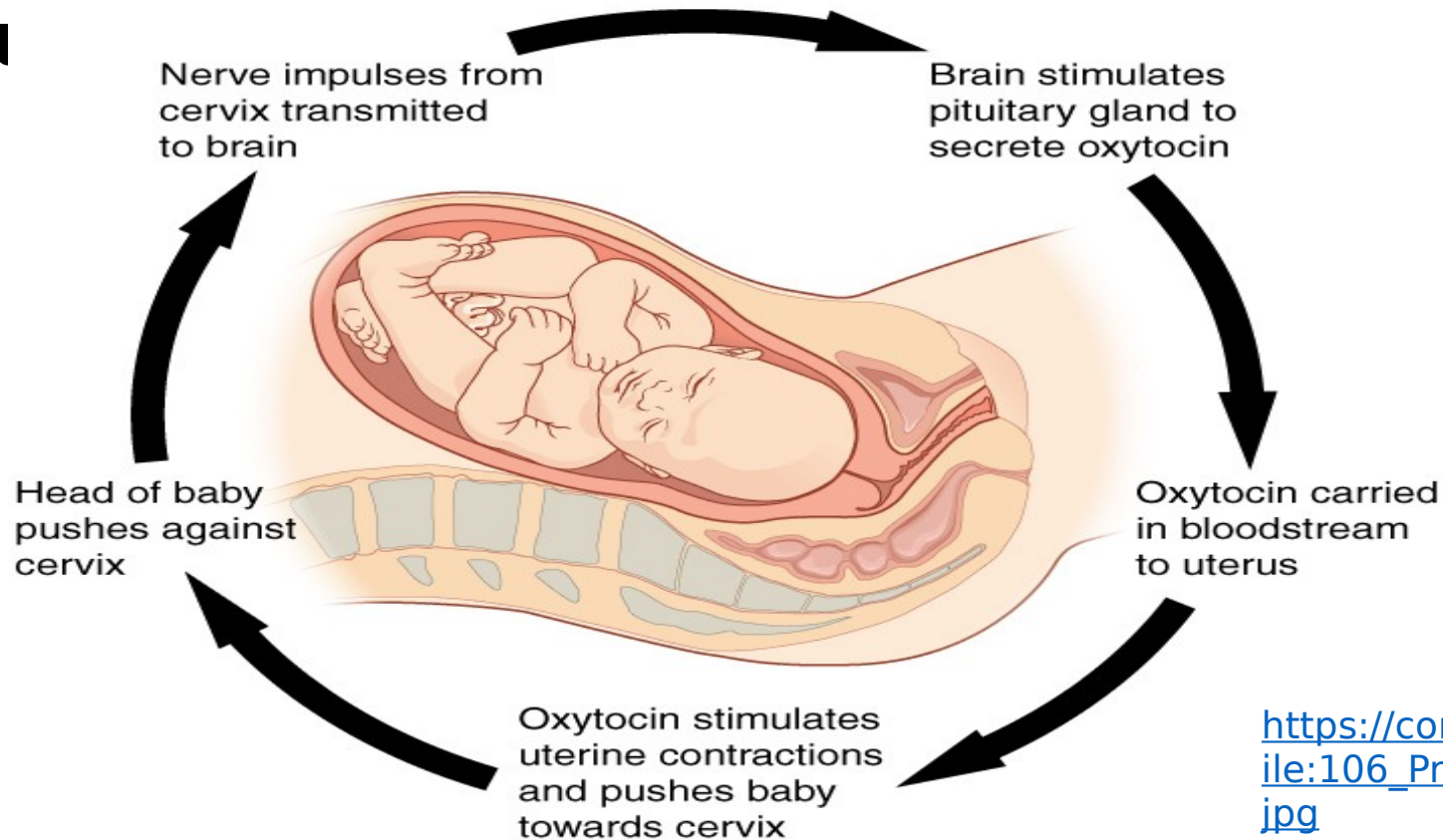
<http://pages.ucsd.edu/~mboyle/COGS11/COGS11-website/pdf-files/SU18-12-COGS11-Oxytocin%20-%20Is%20it%20truly%20the%20Love%20Hormone-black-kitten-group>

Oxytocin



Action:

2- Contraction of the smooth muscle of the pregnant



https://commons.wikimedia.org/wiki/File:106_Pregnancy-Positive_Feedback.jpg



Action:

3- Oxytocin may also cause contraction of the nonpregnant uterus

These contractions facilitate sperm transport up the female genital tract to the uterine tubes, where fertilization normally takes place

4-Oxytocin has role in males

Oxytocin level increases at the time of **ejaculation** which possibly causes increased contraction of the smooth muscle of the vas deferens, propelling sperm toward the urethra.



Regulation:

The secretion of oxytocin is increased by:

- Suckling stimulates oxytocin release (suckling reflex).
- Genital tract stimulation during sexual intercourse in males and females.
- Dilatation of cervix during Labor through a positive feedback where release of the hormone causes an action which stimulates more of its own release.



Complete:

Oxytocin acts primarily on the breasts and Pregnant uterus and
Milk ejection Childbirth respectively and these action is triggered by
increases in intracellular Ca^{2+} levels

Summary



Neural connections run between the hypothalamus and the posterior lobe of the pituitary gland, and vascular connections between the hypothalamus and the anterior lobe of the pituitary.

The hormones secreted by the posterior pituitary gland are vasopressin and oxytocin. Vasopressin increases the permeability of the collecting ducts of the kidney to water, thus concentrating the urine and causes vasoconstriction. Oxytocin acts on the breasts (milk ejection) and the uterus (labor).



1- Which of the followings best describes anti-diuretic diuretic hormone (ADH) ?

- a. Produced by the anterior lobe of the pituitary gland.
- b. Released by neurosecretion.
- c. Increased by a low plasma osmolarity.
- d. Increased by increased stimulation of atrial stretch receptors .
- e. Increasing water permeability of the proximal convoluted tubules.



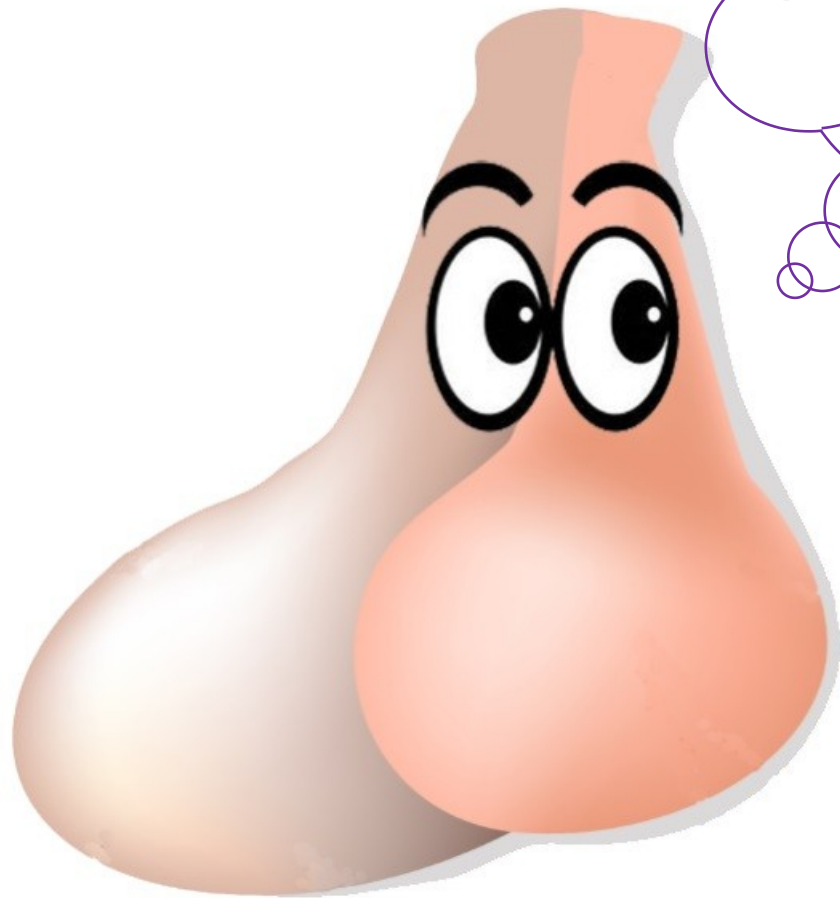
2- which combination of hormones helps a mother to produce milk and nurse her baby?

- a. Prolactin and calcitonin.
- b. Oxytocin and prolactin.
- c. Follicle-stimulating hormone and luteinizing hormone .
- d. Luteinizing hormone and oxytocin.
- e. Oxytocin, prolactin, and luteinizing hormone.

SUGGESTED TEXTBOOKS



1. Ganong's Review of Medical Physiology, twenty-fifth edition 2016, McGraw-Hill Education, chapter 17-18, from page 307 to 334
2. Guyton and Hall textbook of medical physiology, thirteenth edition 2016, Elsevier, chapter 76 , from page 939 to 950
3. Lauralee Sherwood Human Physiology: From Cells to Systems, Ninth edition 2016. CENGAGE, chapter 18, from page 646 to 652



***Thank
You***